

# Spheros Digital Controller

## User manual & operating instructions



### 1. Key Features

The 3093 is a high-precision digital automotive HVAC controller designed to manage cabin climate with efficient, automated operation. The system includes the following core functionalities:

- **Dual-Purpose LED Display:** A two-digit LED display clearly indicates both the current cabin temperature and the target setpoint temperature.
- **Status Indicators:** Integrated LEDs display the active fan speed and clearly distinguish whether the system is in Heat or Cool mode.
- **Configurable Temperature Units:** Temperature display can be toggled between Fahrenheit (°F) and Celsius (°C). This is selected via a hardware jumper located on the back of the PC Board. *Note: The unit is shipped from the factory configured in Fahrenheit. The jumper must be set to the preferred unit before physical installation.*
- **Broad Setpoint Range:** Supports a customizable temperature setpoint range of 50°F to 99°F (or 10°C to 45°C).
- **Non-Volatile Memory Recall:** When the controller is powered on, it automatically recalls and applies the setpoint temperature and fan speed settings from its prior operation.
- **Automated Climate Optimization:**
  - To conserve energy and optimize comfort, the fan speed automatically drops to **Low Speed** and the active Heat or Cool output turns off completely once the target setpoint temperature is successfully reached.
  - The system will automatically resume its prior fan speed setting and re-engage the necessary Heat or Cool output as soon as the measured temperature drifts **2°** away from the configured setpoint.

## 2. System Operation

### 2.1 Powering On and Mode Activation

1. **Power Up:**

Upon receiving power, the controller restores all system settings exactly as they were configured during previous operations.

2. **Activating from Off State:**

If the unit is currently turned off (all LEDs are unlit), press the **MODE** button to activate it. The current temperature will immediately be displayed.



3. **Target Setpoint Evaluation:**

- **Within Setpoint Range:**

If the current ambient temperature is already within the designated setpoint target, only the Low speed LED will illuminate, and climate outputs remain idle.

- **Outside Setpoint Range:**

If the ambient temperature is outside the setpoint target, the user-selected fan speed engages. The system will automatically engage **Heat** if the measured temperature is below the setpoint, or **Cool** if the measured temperature is above the setpoint.

### 2.2 Adjusting Fan Speed

- **When Temperature is Outside Setpoint**

**Range:** Press the **FAN** button to manually change the fan speed. Each button press cycles the speed sequentially through **LOW** → **MED** → **HIGH** and repeats.

- **When Temperature is Within Setpoint Range:**

Pressing the **FAN** button will update and save the new fan speed setting in the system's memory, but the physical fan will remain at Low Speed until the ambient temperature leaves the setpoint target range.



## 3. Adjusting the Temperature Setpoint

To modify the target temperature configuration, follow these procedural steps:

1. Ensure the unit is powered on and the temperature display is actively illuminated.
2. Press the **UP arrow button** to increase the target setpoint temperature or the **DOWN arrow button** to decrease it.
3. Upon pressing either arrow button, the display switches to show the current setpoint target, and **both the HEAT and COOL LEDs will light up simultaneously**. (Note: System outputs do not alter during adjustment except under the specific threshold conditions outlined below). Press the respective arrow button repeatedly until your desired target temperature is displayed.
4. The display will continue to show the newly selected setpoint, and both the HEAT and COOL LEDs will remain continuously lit for **5 seconds** following the final button press before reverting to the standard view.
5. **Immediate Threshold Reactions:**
  - If the newly selected setpoint temperature exactly matches the actual ambient temperature, the controller will immediately turn off the active HEAT or COOL output and force the fan speed to Low.
  - If the adjusted setpoint is shifted **2° beyond** the actual ambient temperature, the system will immediately restore the user-defined fan speed setting and engage either the HEAT or COOL output as dictated by the environment.



## 4. Error Diagnostics and System Safety

The controller continuously monitors system status and temperature sensor integrity when the unit is turned **ON**. The table below details system responses to critical error conditions:

| Trigger Condition / Error Detected  | Display Behavior           | Automatic System Action   |
|---|----------------------------|---|
| Actual temperature exceeds 99°F OR the temperature sensor experiences a short circuit.          | Flashes "99" continuously. | Automatically engages the <b>COOL</b> output (if it is not already running) as a safety override. |
| Actual temperature drops below 0°F OR the temperature sensor open circuits / becomes unplugged. | Flashes "0" continuously.  | Automatically engages the <b>HEAT</b> output (if it is not already running) as a safety override. |

**Manual Override:** Pressing the **MODE** button to actively switch the controller into the **OFF** state will instantly override all error protocols and terminate all system outputs completely.

## 5. Wiring and Pinout

### J1: 8-Pin Power and Control

- Pin 1: +12 V
- Pin 2: N/A
- Pin 3: Ground
- Pin 4: Cool
- Pin 5: Heat
- Pin 6: Low
- Pin 7: Medium
- Pin 8: High

### J2: 2-Pin Connector

- Pin 1: Thermostat Connection
- Pin 2: Thermostat Connection

### J3: 2 Pin Connector with Jumper

- Pin 1: Fahrenheit
- Pin 2: Celsius

